1.01; correct?
MR. MCCRACKEN: Objection; indefinite, vague and ambiguous.
THE WITNESS: Can you repeat the question, please?
(Record read.)
THE WITNESS: Yes.
BY MS. REZNIK:
Q And the software version change that he's describing relates specifically to load compressor closed loop surge control, Figure 10; correct?
A Yes.
Q The court reporter just handed you what's been marked Exhibit 251, with Bates numbers HSA 440124 through 286. Do you have that in front of you?
A I have a document with those Bates numbers in the front and back, yes.
(Plaintiffs' Exhibit 251 was marked for identification by the court reporter.)
BY MS. REZNIK:
Q Okay. Great. If you look at this document, can you tell me what it is?
A It's the APS 3200 ECB requirements specifications for revision J.
Q And as we've already described, ECB

requirements specifications require -- for software APS 3200 include surge control and fuel control systems; is that correct?
A Yes.
Q And this is an earlier version of revision J, but there is a more recent version that we've already looked at in previous depositions?
A There are more recent versions. I don't recall whether we -- which ones specifically we talked about in previous depositions.
Q But the one we are looking at happens to be an earlier version; correct?
A It is not the current version, yes.
Q Do you see in the distribution list Mr. Maedche is among those individuals copied on this document?
A Yes, I do.
Q Can you tell me if Mr. Maedche had any role in developing this document in particular?
A I found no evidence to suggest that he had input. But as I mentioned earlier, that doesn't mean that -- just because I couldn't find any evidence doesn't mean that he didn't have some input to the document.
Q Can you define for me what role he might have had?

MR. MCCRACKEN: Objection; speculative.
THE WITNESS: No, I can't.
BY MS. REZNIK:
Q What type of evidence would indicate that he had a role in developing the requirements specified in this exhibit, Exhibit 251?
MR. MCCRACKEN: Objection; assumes facts not in evidence.
THE WITNESS: Can you repeat the question, please?
(Record read.)
THE WITNESS: If there were memos or presentations or something which was written and retained with his name.
BY MS. REZNIK:
Q Memos like the one we were just looking at where he was authoring the memo regarding a particular software version?
A That would be an example, yes. I'm not sure of the relative timing of that memo versus this release of specifications, which is why I don't know if he had input to this version of software.
Q But you are saying it's possible that he may have. You just wouldn't know the specifics?
A Correct.

Q As you mentioned earlier, Mr. Maedche was one of the four members of the control group for the APS 3200; correct?
MR. MCCRACKEN: Objection; asked and answered.
THE WITNESS: Yes. At that time.
BY MS. REZNIK:
Q Right. And it was the role of the control group to design and develop the control logic of the APS 3200; correct?
MR. MCCRACKEN: Objection; asked and answered.
THE WITNESS: Correct.
BY MS. REZNIK:
Q So would it be fair to say that Mr. Maedche played a very significant role in the design and development of the APS 3200 control logic?
MR. MCCRACKEN: Objection; indefinite and vague.
THE WITNESS: No. He did not play a significant role in the 3200 development.
BY MS. REZNIK:
Q How would you define his role?
A Insignificant.
Q And what evidence do you have that it was insignificant?
A The date which we established that he came to

Sundstrand Company was in December of 1992, by which time a significant part -- by my use of the words "significant part" -- of the control system logic had already been defined. The control system was in existence. All of the decisions on how the control system would function had been made.

What needed to be done after that was fine-tuning setpoint changes -- sorry. Not setpoint -- gain changing, like you mentioned earlier, but what I call insignificant, minor changes, not changes to the fundamental architecture of the system.

Q So are you saying that those members of the control group for the APS 3200 during that time frame that Mr. Maedche was part of that group wouldn't have played any significant role in the APS 3200 control logic?

A No. I'm saying that the control logic was defined by Kourosh Mehr-Ayin and then followed by Ed Edelman in the '91, '92 time frame, prior to Mr. Maedche joining Sundstrand.

Q So there was no further development of the control logic after the '92 time frame?

A There was some development, but you used the word significant earlier, and it was absolutely not significant after that time.

Q So is it fair to say that he played a somewhat significant role in the development of the APS 3200 control logic?

A No. It's not fair to say that.

Q Is it fair to say that he played a role in the design and development of the APS 3200 control logic?

MR. MCCRACKEN: Objection; vague and indefinite.

THE WITNESS: He played a minor role.

BY MS. REZNIK:

Q Can you describe for me what his role was in the design and development of the APS 3200 control logic?

A We established that he did some testing of the transient response of the APS 3200 control system. We established that he was our point man for the flight test campaign, and thus he was viewing flight test data in Europe. That he played a minor role -- his time, while he was in Europe, was quite easy. We were not flight testing every day. He had the opportunity to work only the days that we were testing. So he was actually away from the core group for a three-month period even during his short employment with Sundstrand.

Q So other than the testing of the transient response in the APS 3200 control system and other than

the flight testing you just described of the APS 3200, did Mr. Maedche have any other role with regard to the design and development of the APS 3200?

MR. MCCRACKEN: Objection; asked and answered.

THE WITNESS: Not that I found evidence to suggest, no. You pointed out one memo where he had -- the last exhibit where he had made a gain change, a minor, moot modification.

BY MS. REZNIK:

Q But that was an example of other than these two things you just described; correct?

A No. That was -- the gain change was related to the transient testing that he had done.

Q So the transient testing, then, relates to the load compressor closed loop surge control diagram in Exhibit 250; correct?

A It relates to the modification here on SRGSPL. That is a gain -- that is a gain in the system control gains. Gain effect response -- transient response, and this was slowing the system down.

Q Do these control gains relate to the measurement of surge in the surge control system?

A No.

Q What does it relate to directly?

A They relate to how rapidly the bleed control

valve movement moves.

Q And that is a function of what?

A Many things.

Q But does it include the measurement of the air flow to the load compressor, the delta P/P?

A That is one that causes the BCV to move.

Q So, then, it's fair to say that the transient response testing that Mr. Maedche was involved in for the APS 3200 included analysis of various control gains that would be necessary in the surge control system?

A When you say -- "various" is somewhat wide, but certainly some, yes. We've identified one specific gain in which he recommended a change.

Q Well, then, we can say that the transient response testing that Mr. Maedche was involved in for the APS 3200 included analysis of this particular control gain in the APS 3200; correct?

A Yes.

Q And as we described, the control relates to the operation of the bleed control valve; correct?

A In certain circumstances, yes.

Q So, in fact, if we look at Exhibit 250, this particular control gain change that Mr. Maedche is referring to, that would have arisen as a result that his transient response testing had an impact on the

software version; correct?
MR. MCCRACKEN: Objection; indefinite and vague.
THE WITNESS: Can I take this?
MS. REZNIK: Yeah. Go ahead.
THE WITNESS: The words written here just state make a change. They don't state why. There is no definition as to why -- the logic behind the reasoning for this gain change.
BY MS. REZNIK:
Q That wasn't my question. My question was that this control gain change that Mr. Maedche recommends had an impact on the software version of the APS 3200 control logic described in Exhibit 250; correct?
A They have an effect on this figure, yes.
Q The figure being?
A The Figure 10.
Q The control system?
A Of this Deposition Exhibit 250 titled "Load Compressor Closed Loop Surge Control."
Q Okay. Is there any other role Mr. Maedche would have had as a member of the control group for the APS 3200?
MR. MCCRACKEN: Objection; asked and answered.
THE WITNESS: Not that I found evidence to

suggest, no.
BY MS. REZNIK:
Q Could you describe for me the contributions made by Mr. Maedche as a member of the control group for the APS 3200?
MR. MCCRACKEN: Objection; asked and answered.
THE WITNESS: He worked on the transient system, the APU testing that we discussed, and he supported the flight test campaign.
BY MS. REZNIK:
Q So is it fair to say that his testing of the transient response included analysis of load compressor controls relating to delta P/P?
A If by delta P/P you mean the input -- one of the many inputs to the control system, then the answer would be yes.
Q And a load compressor control we are talking about relates specifically to the APS 3200; correct?
A Yes.
Q Is it fair to say that Mr. Maedche's role in the testing of the transient response involved several system development testings of the APS 3200?
A Yes.
Q Is it fair to say that Mr. Maedche's testing of the transient response on the APS 3200 involved flow

sensor testing in the control system?
A No.
Q Is flow sensor testing at all related to the testing of the transient response in the APS 3200?
A What do you mean by "flow sensor"?
Q Well, we were looking at various exhibits -- memos that had described flow sensor testing.
A I don't recall.
Q You can look back. If we look at Exhibit 234 again, for example, you had described a sheet attached to it that described the flow sensor characteristics; correct?
A That's what this figure says, yes.
Q You had indicated that Mr. Maedche was continuing discussions with Airbus at the time, evaluating the check valve and the possible relationship between the check valve and these flow sensor characteristics; correct?
A I mentioned the relationship between the check valve and the flow out of the load compressor.
Q And the flow out of the load compressor relates to flow sensor characteristics in some way?
A The reason I asked for the definition of flow sensor -- this is Turbomeca's original -- it was their choice of words, translating from French. It was not

normal for us to call this flow sensor characteristics. To me, flow sensor is a piece of hardware that measures something. This is just what I call the delta P on P curve, which related the -- which is a relationship between load compressor flow and delta P static on P static as measured on the APS 3200.
Q Okay. So, then, is it fair to say that Mr. Maedche's testing of the transient response included evaluation of this relationship between load compressor flow and the delta P/P?
A No. He wasn't evaluating this curve. He was evaluating the control system as it used this curve. We never tried to duplicate our test or check to see if -- the accuracy of the Turbomeca information and use it.
Q Okay. Then let me rephrase the question. Is it fair to say that Mr. Maedche's testing of the transient response included evaluation of the APS 3200 control system as it used this delta P/P curve?
A Yes.
Q Is it fair to say that Mr. Maedche had a role in the software control logic design for the APS 3200?
MR. MCCRACKEN: Objection; ambiguous and vague, and it's been asked and answered a number of times.
THE WITNESS: He had a minor role.
BY MS. REZNIK:

Q But he did have a role; correct?
MR. McCRACKEN: Objection; asked and answered.
THE WITNESS: He had a minor role.
BY MS. REZNIK:
Q Is it fair to say that Mr. Maedche's testing of the transient response in the APS 3200 included evaluation of IGV schedules in relation to the delta P/P?
A There is no relationship, so the answer is no.
Q Would he have ever evaluated whether or not there was a relationship?
A No.
Q Would he have evaluated the IGV schedules at all in the testing of the transient response of the APS 3200?
A No.
MR. McCRACKEN: Objection; vague.
BY MS. REZNIK:
Q We are looking back at Exhibit 235. We see that it's a memo written by Mr. Maedche to Mr. Hardy regarding IGV minimum position; correct?
A Uh-huh.
Q So Mr. Maedche did have some role in analyzing IGV in the APS 3200 based on this memo?
A Yes.

Q Are you aware that he used to work for AlliedSignal or Garrett, now known as Honeywell?
A Yes.
Q Are you aware that he used to work on AlliedSignal, now Honeywell's APUs?
A No, I wasn't.
Q You may have already answered this question, but did he have any other job title other than systems engineer -- Mr. Crooks?
A No.
Q You've just been handed Exhibit 252, Bates numbers HSB 145329 through 333. Do you have that in front of you?
A 145329 through 145333?
Q Yeah.
A I do.
(Plaintiffs' Exhibit 252 was marked for identification by the court reporter.)
BY MS. REZNIK:
Q Can you tell me what this is?
A This is the APS 3200 pneumatic compatibility test results for software version 4.1.
Q Do you see that Mr. Crooks is copied on this memo?
A Yes, I do.

Q Are you familiar with a Mr. Branch Crooks?
A Yes.
Q How are you familiar with him?
A He works as a systems engineer at Sundstrand.
Q Is he still employed at Sundstrand?
A Yes.
Q Is Mr. Crooks still a systems engineer at Sundstrand?
A Yes.
Q So is it fair to say Mr. Crooks, as systems engineer, is responsible for the surge control system of the APS 3200?
MR. McCRACKEN: Objection; ambiguous and vague.
THE WITNESS: Sorry. Could you repeat the question, please?
(Record read.)
THE WITNESS: Is responsible? The answer is no.
BY MS. REZNIK:
Q Was Mr. Crooks ever responsible for the surge control system of the APS 3200?
A He worked on the control system for the APS 3200, yes.
Q Including the surge control system?
A Including the surge control system.

Q Can you describe for me what pneumatic compatibility testings are?
A It's -- we have a standard test procedure which is intended to be a very tough and aggressive test of the APS 3200 load compressor controls, which we do in our section in San Diego. As I say, it's very tough and aggressive. On the basis of passing this test, we feel comfortable that the APS 3200 will go into operational service in the form specified. So this is a test report that has test results documented which shows that we have completed that test for this particular version of software version 4.1.
Q Can you describe for me what Mr. Crooks' role was in this software version 4.1?
A He was the systems engineer for the APS 3200 at that time, in July 1996.
Q What contributions did he make to the software version 4.1? Let me rephrase it. What contributions did Mr. Crooks make to the software version 4.1 of the APS 3200?
A He was, as I say, the systems engineer. He wrote the systems specification for this particular version of software, which was a minor modification on the previous software. Version 4.1 -- as I mentioned to you before, we had -- version 2.0.2 went into service.

It was followed by a version called 3.2, which was removed for unrelated reasons. The next version which followed was version 4.1.

It was exactly the same as version 3.2, with the changes to some internal software. One particular change, because of version 3.2, had been withdrawn for a particular reason that addressed that reason. It was run, eliminated to APU control load compressor control. So Branch Crooks, in answer to your question, was the systems engineer at the time.

Q So as the systems engineer, Mr. Crooks was responsible for the systems specifications, including surge control and fuel control logic of the APS 3200; is that correct?

A There were only minor modifications in version 4.1 from version 3.2. In answer to your question, yes, he was the systems engineer responsible for -- at that time.

Q You mentioned that he's currently an employee of Sundstrand; is that correct?

A Yes.

Q And he's still a systems engineer; is that correct?

A Yes.

Q Is he still working on the APS 3200?

A No.

Q What is he working on now?

A He is a resident in the city of Phoenix. He's doing some simulations for other programs.

Q Do you know when he stopped his work on the APS 3200?

A March '97.

MR. MCCRACKEN: Are you finished with this exhibit? Because I'd like to ask for a brief recess. I have to make a telephone call.

MS. REZNIK: Yeah. I'm done with this exhibit.

(Recess.)

BY MS. REZNIK:

Q Mr. Suttie, I'm handing you what's been previously marked as Exhibit 22. Can you tell me what this document is?

A It's an agenda for a meeting which we had in San Diego on March 16, 1990 between Turbomeca and Sundstrand.

Q If you turn to HSA 176198, you'll see a diagram.

A The last three digits again, please.

Q 198. Do you have this diagram in front of you?

A HSA 176198, yes.

Q This is a diagram of the APS control system as

of the date of this memo, March 16, 1990; correct?

A Yes. The proposed system. We hadn't built the system at that point.

Q If you look up at the top of this diagram -- I think it's legible -- there is a line that says delta P/P. Do you see that?

A I see a line called delta P on P, yes.

Q And that's leading to?

A Delta P on P7.

Q Okay. And that's leading to what has been previously called the summing junction; is that correct?

A Correct.

Q And then from there that value goes into a PI controller; correct?

A A combination of that value plus another value go into the PI controller. So it's not exactly that value anymore. Once it goes through the summing junction, it changes.

Q Whatever value is created by the summing junction is then this PI controller?

A Yes.

Q And that ultimately leads to the surge valve command to the right of this PI controller; correct?

THE WITNESS: Say that again.

(Record read.)

THE WITNESS: Yes.

BY MS. REZNIK:

Q If we go back to the summing junction, you were referring to other values that were inputted into it; correct?

A Yeah.

Q One of those values is an IGV charge; is that correct?

A If we are talking about the summing junction, the summing junction is called setpoint.

Q Based on this diagram, the setpoint is adjusted in response to variation and the position of the IGVs; is that correct?

A Among other things, yes.

Q Was this surge control system designed prior to this memo of March 1990?

A The first version of this diagram that I could find was September of 1989.

Q So September 1989, when the surge control system was designed -- let me rephrase that. Is September 1989 the date on which the surge control system depicted in Exhibit 22 was designed?

THE WITNESS: It's my phone.

(Telephonic interruption.)

(Recess.)

THE WITNESS: "Designed" isn't the word I would use. We proposed this. This was a September presentation that I'm referring to -- was a presentation to our OEM customer then known as MBB and later became DA. That figure was in a presentation and then also in the proposal. So you don't design for a proposal. You put down as many ideas as you can, to try to show your customer that you understand the subject, know what you know, leave yourself as many open possibilities as you can.

And so I wouldn't use the word "designed." It was conceptualized, you know, at a very high level for -- for a presentation under proposal, but that's quite different from a design activity, which takes much longer and turns into real equipment. As I mentioned before, this was never actually implemented as shown here.

BY MS. REZNIK:

Q I'm going to show you now what's been previously marked as Exhibit 74. Is this the proposal you were referring to regarding MBB, the OEM customer?

A At a quick first glance, yes. It looks like the proposal.

Q Can you turn to HSA 2610147 You'll see a diagram.

A 26 --

Q -- 1014. Do you have that in front of you?

A Yes.

Q Okay. Can you compare the diagram in Exhibit 22 to this diagram in Exhibit 74 and tell me if they look like they are the same diagram?

A The figure number is different. This particular -- the proposal version has a number Figure 4222, dash, 1, which the first exhibit you showed me does not have. Beyond that, I think that they are the same. This is a poor quality representation because of multiple copies, by the look of this. So some of the subscripts are not easy to read, but it's my understanding they are the same.

Q So the surge control system depicted in Exhibit 22 was proposed to the OEM customer MBB, also known as Airbus, in September 1989; is that correct?

A The proposal date was actually October.

Q Oh, October. Okay.

A But, yes. October 11th, 1989.

Q So let me rephrase it. The surge control system depicted in Exhibit 22 was proposed to MBB, also known as Airbus, in October 1989; is that correct?

A Yes.

Q Okay. You proposed this design to Airbus in

1989. Had you conducted any testing on that system?

A No.

Q Had you conducted any development of the system depicted in that diagram?

A No.

Q So what were you using to base the proposal on?

A The control system that was presented here was devised by a combination of myself, Wendell Reed, and Malcolm McArthur. It was a collective outcome of three control systems engineers who felt that this system, as shown here, would be sufficient and adequate to control an APU such as APS 3200.

As I mentioned earlier, we were trying to show our customer that we had thought of possibilities and as many features as possible. So we were trying to show everything. Whether we thought it may be necessary or not, we were trying to show that we had considered all of the potential nuances for this type of APU.

Q So the surge control system depicted in Exhibit 22 and also in Exhibit 74 was designed by a combination of you, Peter Suttie, Malcolm McArthur, and Wendell Reed?

A Yes.

Q Were any other individuals involved in the design of this surge control system depicted in Exhibit

22 and Exhibit 74?

A No.

Q Did you have any input from Turbomeca regarding this particular design?

A No.

Q Turn to Exhibit 74, again, page HSA 260926.

A 260 --

Q -- 926. I'll give you a minute to find it.

A 2609267

Q Yeah. Do you have that in front of you? Do you have that page in front of you?

A Titled "Performance APS 3000 Meets A321 Requirements"?

Q Yes. This is a chart that shows the performance of the APS 3000 with respect to Airbus specification requirements; correct?

A Yes.

Q And under APS 3000 performance, it shows a measurement of bleed air flow and bleed air pressure; is that correct?

A Underneath APS 3000 performance, yes.

Q It's actually APS 3000 performance.

A 3000 performance.

Q How did you arrive at these measurements of the APS 3000?

A They are not measurements. They are predictions. APS 3000 did not exist at the time. It's just a proposal, and Turbomeca supplied these numbers.
Q What did Turbomeca base these numbers on?
A I'm not prepared to answer that. You need to ask Turbomeca.
Q I believe that is covered in topic 4.
MR. McCRACKEN: But that's not information within the company's domain. That's not something that -- we don't control Turbomeca.
BY MS. REZNIK:
Q So are you telling me that you are not prepared to answer any questions regarding Turbomeca's role in the development of the surge control system of the APS 3200 or APS 3000?
A No. I'm not saying that. Your question doesn't relate to control system performance. This happens under work performance, which means how much air the APU supplies. The control system has no impact to this. This is a function of the size of the machine, of the bleed angles, of the design of the APU itself, not the control system. Systems engineers separate, very clearly, performance from control system. This is related to the performance of the machine and, therefore, doesn't affect the control system.

Q Turn to 261015 of Exhibit 74.
A 261 --
Q -- 015. Do you have that page in front of you?
A Yes, I do.
Q If you look at column 2 of this page, can you read for me beginning in the middle of the paragraph with "The velocity head is measured," please?
A The velocity head is measured using the different delta P between total P7t and static pressure P7s from an air flow sensor mounted in the load compressor discharge line. The delta P divided by the pressure P7s is calculated from two transducer signals. A desired setpoint of delta P over P7s is established, based on measured corrected speed and inlet guide vane position, with sufficient margin relative to the surge lines illustrated in Figure 4, slash -- 4, dash, 27. The value of the measured delta P on P7 is compared with the setpoint value and, if the setpoint is transgressed, the anti-surge valve is modulated open.
Q Based on the language of this page, it says the desired setpoint is based on the measured corrected speed and inlet guide vane position; correct?
A Yes.
Q And that's what the diagram we looked at depicts; correct?

MR. McCRACKEN: If I may make a comment on the record, Counsel. It's been our goal to cooperate fully in responding to the 30(b)(6) information. However, for whatever reason -- and I can't explain why this should be -- several of the items that are requested are simply not under our control. We just don't have the ability to control or otherwise force anyone outside of the company to respond.
So there's going to be circumstances, I'm afraid, where you're going to want information that we just can't provide you with. It would be more appropriately asked of a third party, and this is one of those cases.
BY MS. REZNIK:
Q So is it fair to say that the values provided here regarding APS 3000 performance were not based on the testing of an APS 3000 that was actually built?
A Correct. It was not. At this time, there was no APS 3200 built.
Q 3000 or 3200?
A 3000. Neither.
Q So these performance numbers would have to come from another APU, not a built APS 3000; is that correct?
A I don't know the source of where Turbomeca obtained those numbers.

A Yes.
Q Who is the source of that design?
A The same combination of myself, Wendell Reed, and Malcolm McArthur.
Q How did you come up with that design?
A It was -- as I mentioned with the figure -- the belief of three control systems engineers that this would be a sufficient and adequate system to control a load compressor -- a load compressor APU.
Q What did you base your analysis on?
A There wasn't an analysis as such. It was through the conceptual design and creation that we talked about earlier. The engineers group, being both Malcolm and Wendell, very experienced control systems engineers -- it was their feeling that this would be a sufficient and adequate method to control the load compressor.
Q Can you tell me what this feeling was based on?
A Their experience as control systems engineers.
Q But to come up with these types of figures and analysis, it had to have been derived, as you say, from previous experience, but previous experience with other APU systems. Is that a fair statement?
A We -- when I say "we" -- that Sundstrand had an APU KC-135, which was a load compressor APU, which is

already operating. And though that APU does not use this feature, it prompted these experienced control systems engineers to believe that it might be necessary. It was -- as I mentioned earlier, it's kind of a place holder that we -- it is easier to put more into a proposal and go to your customer than say we don't need to do this -- than to do the reverse, which is to appear like you have missed something.

Q So it's your understanding that the adjustment of the delta P/P setpoint from the position of the guide thing was a model based on Wendell Reed, Malcolm McArthur, and yourself, experience with other APUs such as the KC-135; is that correct?

A Yes.

Q Did this experience include testing of the KC-135 to see if making the setpoint adjustment relationship IGV setting would work?

MR. McCRACKEN: Objection. There is lack of relevance to the issue of the lawsuit with respect to this line of questioning. I'll enter a standing objection. I won't repeat myself.

THE WITNESS: As I mentioned, the KC-135 does not have this feature, but it was felt prudent to show it in a proposal. So should it be needed, then we wouldn't be in a situation of trying to add something

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that we hadn't mentioned in a proposal. You are always trying to show that you've covered all of the potential eventualities, even though it's not necessary, and this, in fact, was not necessary in this particular case. IGVs are not used to vary the setpoint.

BY MS. REZNIK:

Q So at the time this proposal was made in 1989 to Airbus, was there any testing of this method of adjusting the setpoint?

A No.

Q Was there any development at all with respect to the adjustment of the delta P/P setpoint in relation to the inlet guide vane position?

A Any development, no.

Q So this proposal made to Airbus was based solely on prediction of what might work in the future. Is that a fair statement?

A What three experienced control systems engineers thought might work, yes.

Q If you look at HSA 261016 of Exhibit 74, it shows a diagram; correct?

A Yes.

Q And this diagram at the bottom shows IGV degrees; correct?

A Yes.

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Q And on the left-hand side of this diagram, it shows delta P/P, small 7, small s; correct?

A Yes.

Q What does this diagram depict?

A It's an estimate of how the delta P on P value measure may change as a result of IGV -- movement of IGVs at various speeds. We mentioned earlier another input to that was corrected speed. That's what N and C stand for -- corrected. So, in fact, if you look at these figures, while there is some fluctuation for a particular speed, they are relatively flat, indicating that there is, as predicted here, actually a minor impact of IGV -- changing IGV angle on delta P on P.

Q Can you tell me where this information came from depicted on this chart?

A I did not prepare to find out where this figure came from.

Q You came prepared today to testify as to the source of the design in Exhibit 22; correct?

A As marked by HSA 174198, yes.

Q So we are talking about the depicted surge control system in Exhibit 22 that you've prepared on; correct?

A Yes. This. As defined here in topic 2 of your memo we discussed earlier.

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Q But you said to me that you also looked at Exhibit 74, correct, in your preparation?

MR. McCRACKEN: Could you show the witness Exhibit 74?

MS. REZNIK: He's holding it.

THE WITNESS: I looked at this figure, which is in Exhibit 74, as page 261014, yes, because they are identical; therefore, they are the same. But I did not look at other pages of the proposal with the same intention.

BY MS. REZNIK:

Q I understand. But we are talking about the source of the surge control system that happens to be depicted in this diagram, which we've already decided are one and the same in Exhibit 22 and Exhibit 74; correct?

A This figure and this figure are one and the same, yes.

Q And we are looking at the source of the surge control system that happens to be depicted in that diagram; correct?

A I don't know what you mean by "the source."

Q That's what the topic defines: The source of the surge control system, where the design came from, how it was obtained. That's the type of questions we

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are looking at.
A Okay. The source of this was the collective inputs from control systems engineers Wendell Reed, Malcolm McArthur, and myself.
Q And we were discussing specifically the IGV setting in relation to delta P/P; correct?
A Yes.
Q And the chart on 261016 of Exhibit 74 is directly talking about that relationship; correct?
MR. McCRACKEN: But I don't understand the connection between the word "source" and the -- in the notice versus what is being shown here. I don't. It's not apparent to me what the relevance is of the relationship even between those two things.
MS. REZNIK: Can you answer the question?
THE WITNESS: Can you repeat the question, please?
(Record read.)
BY MS. REZNIK:
Q Exhibit 74 on HSA 261016 is talking directly about the relationship between the IGV angle and the delta P/P; correct?
A It's talking about what three systems engineers thought might be the relationship, yes.
Q So can you tell me where the information for

the IGV setting in relation to delta P/P came from?
A This is just a representation of what three systems engineers thought might be necessary to control the APU. There are no hard numbers associated with any of the information in this figure. It was a proposal. It was prior to even the program being proposed. So I don't understand the question.
Q Is it your testimony, then, that the figure on HSA 261016 wasn't based on any hard numbers?
A As I said, I did not research the source of this figure.
Q So you're unprepared to testify about the source of the information relating to this chart?
A 261016 --
MR. McCRACKEN: Can I have a moment with the witness? Maybe we can clear this one up and give you an answer.
MS. REZNIK: Okay.
(Recess.)
BY MS. REZNIK:
Q Can you tell me the source of the information for this chart on Exhibit 74 at HSA 261016 depicting IGV angle in relation to delta P/P?
A I believe the source of this was Wendell Reed who, I think, prepared this figure on a software package

he had in his home computer.
Q So it's fair to say this was a prediction of how it would react?
A Yes. It absolutely was a prediction because there was no physical hardware available to measure or to determine the value in any other way other than to predict.
MR. McCRACKEN: You realize, Counsel, that Wendell Reed is no longer employed by the company, and that's the reason for the answer. He had no way of getting that information, so --
BY MS. REZNIK:
Q Do you know when Wendell Reed left the company Sundstrand?
A I believe it was in March of 1990. He and I -- we only worked together for a short period of time during the development of this proposal, and then he was -- he was already a retiree. He just came back as a consultant to support us in this activity, and he retired again.
Q Do you know what his job title was when he was working at Sundstrand?
A Consultant -- control systems consultant. I don't know exactly, but that's the role he fulfilled.
Q Do you know if Mr. Reed's primary

responsibility was development of a surge control system for what was then the APS 3000 in 1989?
A His responsibility was to support the proposal effort, including conceptualizing the control system and helping write the proposal text with regard to the control system.
Q Was Mr. Reed a systems engineer, then, at the time?
A Yes.
Q And specifically a systems engineer dealing with control systems; is that right?
A Yes.
Q You mentioned that the surge control system depicted in Exhibit 22 and Exhibit 74 was never implemented; correct?
A This is Exhibit 22?
Q Yes.
A Yes. It was never implemented as shown.
Q Do you know why it was never implemented?
A Because when we obtained information from Turbomeca, the data showed that the delta P on P setpoint did not, in fact, need to be changed as a function of IGVs. And if delta P on P is not a function of IGVs, you do not want to implement an IGV in that control because it could have a negative effect in the

control system. You only do what's minimally necessary to make the system function properly. To add extra features could have a detrimental effect. So it was not necessary. We did not include IGVs.

Q Did you ever test any version of any APU that included the surge control system depicted in Exhibit 22 or Exhibit 74?

A No.

Q So the information you obtained from Turbomeca relating to the delta P/P setpoint wasn't derived from testing of an APU; is that correct?

A The information we got from Turbomeca -- and you've shown it already in one of the exhibits -- was a relationship between delta P on P and flow. It was derived from rig testing of Turbomeca's hardware and equipment in France. They then gave us the relationship which we used in our control system. It was independent of IGVs as it's stated on the figure you've shown me earlier.

Q Do you know what type of testing was done by Turbomeca?

A You need to ask Turbomeca.

Q So Turbomeca never shared with you the basis of their testing of hardware in deriving the delta P/P flow relationship?

Q And Mr. Hardy from Turbomeca was the program manager of this APS 3000 at the time of the 3000 development?

A At Turbomeca. Only responsible for the Turbomeca portion.

Q Let me know if I've got this correct. Is it fair to say that you are not prepared to tell me where Turbomeca has derived the information regarding the unnecessary relationship between the IGVs angle and the setpoint?

MR. McCRACKEN: Objection; ambiguous and vague.

THE WITNESS: Can you repeat the question, please?

MS. REZNIK: Why don't I restate it for you.

Q Are you able to identify for me how Turbomeca derived the information they provided to you on this October 25th, 1991 coordination memo between the relationship of IGV angle and the setpoint?

A They derived that information from rig tests of a compressor. They measured the air flow, measured delta P on P, and through laborious tasks created the relationship by measuring many points and just plotting them along the chart.

Q So is it your testimony that after October 25th, 1991 Sundstrand no longer used variations in

A I never saw the rate they used.

Q You never saw it, but did they ever provide you with any information about the rig testing that they conducted?

A They gave us the data that they collected. That's all the information I care about. I can think of what the rig might have looked like, but I never saw it. I don't really -- it's not really an issue to us. We wanted the output data, which we used.

Q Can you tell me when Turbomeca provided you the information stating that the IGV angles didn't need to affect the setpoint?

A It's written in one of the coord memos. October 25th, 1991.

Q And Turbomeca provided this information in the form of a coordination memo?

A Yes. From Gerard Hardy.

Q Mr. Hardy was your counterpart in Turbomeca; is that correct?

A No. Not at that time.

Q What was his role?

A He was the program manager at that time. His counterpart -- I was the control systems project engineer. So in hierarchy structure, I would have been seen as junior to Mr. Hardy.

position of the IGV to determine the delta P/P setpoint?

A We never used variations of IGV to establish the delta P on P setpoint. After October 25th, the control -- architecture of the control philosophy changed to incorporate the data from Turbomeca and to delete any reference to IGVs affecting the delta P on P setpoint.

Q So, then, it's fair to say that after October 25th, 1991 Sundstrand no longer contemplated using variations in position of IGVs to affect the delta P/P setpoint?

A That would be a fair statement, yes.

Q Is it fair to say the sole basis for Sundstrand's abandonment of that idea was Turbomeca's data supplied to you in this October 25th, 1991 coordination memo?

A Yes.

Q So Sundstrand didn't do any independent testing or analysis to determine whether or not the relationship between the IGV angle and delta P/P setpoint would work?

A No, we did not.

Q And aside from the rig testing and lead compressor testing by Turbomeca that you think went on, you can't tell me if there was any other basis Turbomeca had for providing you with this information in the

October 25th, 1991 coordination memo; is that correct?
MR. McCRACKEN: Objection; vague.
THE WITNESS: The data was originally developed in a rig test. Then as engine hardware becomes available, test engines are built. Test engines are evaluated. Multiple test engines become evaluated. You start to solidify your confidence, and Turbomeca did that. I think there was reference in the coord memo to an engine test.
BY MS. REZNIK:
Q Is it fair to say that you are not familiar with what engine they may have used in their rig testing for this October 25th, 1991 coordination memo?
A Can I answer that by looking at the exhibit you brought out earlier?
Q Exhibit -- can you tell me which exhibit you mean?
A Are we finished with the proposal?
Q I think so. Is there a particular exhibit you think would help you? Is it this one? For the record, I'm handing Mr. Suttie Exhibit 234.
A This is the figure that I asked you to show me. It says compressor assembly numbers, and there are some coded numbers here for Turbomeca's coding of compressor assembly. I thought there might be a test number --

there might be a link there, back to a particular set of hardware. There isn't, that I understand. Perhaps Turbomeca's old internal development configuration system may be able to lead that, but this does not say. I think this was originally part of a Turbomeca coordination memo, which is the one that was October 25th, I think, by looking, but --
Q At the top of this page of Exhibit 234, Bates number HSA 035282, it says APS 3000 load compressor. Is this referring to one of the load compressors they would have been testing?
A Yes. But it's not definitive enough. It could be a load compressor driven by a rig -- a load compressor driven by a motor, typically, or it could be a load compressor driven by a part of any APU. From this information alone, I can't --
Q But this load compressor would have been an actual load compressor, built, running the control logic that we've been talking about; correct?
A No. This isn't running the control logic. This is an actual load compressor, as you state, but it's just turning, and data is being measured. So there is no logic to control test equipment to make it turn and sensors to collect each one of these. Each one of these circles is a data point.

Q So in doing these tests, they are not implementing any sort of logic to make it work; is that right?
A No. They are not implementing any logic to make it work. They are collecting data which will then be fed to logic to make it work. This is a collection of raw data.
Q So to be clear, you can't be sure what load compressors they were actually testing to provide Sundstrand with the information provided on the October 25th, 1991 coordination memo; is that correct?
A From this piece of paper, I cannot be sure. Correct.
Q Is there some piece of paper that would make that clear for you?
A That coordination memo from October 25th.
MS. REZNIK: Counsel, are you sure that this October 25th, 1991 memo was produced?
MR. McCRACKEN: Absolutely. I can assure you of that. Can we go off the record for a moment?
(Recess.)
MS. REZNIK: Counsel's taken a few minutes to confer with his witness, and we've come to an agreement to do our best to try to finish the deposition today as time permits, but with the understanding that I may not

be able to get through everything I've intended to get through today and may have to reserve my right to continue this deposition.
MR. McCRACKEN: And we, as defendant, object to the continuation of the deposition beyond today. We will do everything possible to give as much cooperation to counsel to ensure that that happens.
BY MS. REZNIK:
Q Why don't I go back a few steps to an earlier question so that we can just clarify it for the record, because of all the interruptions.
Earlier you testified that Turbomeca provided data in October of 1991 indicating that their testing had shown that you no longer needed to adjust the setpoint in relation to the IGV angle; is that correct?
A They supplied us data, this curve here, delta P on P versus flow, and from that data we concluded that it was not necessary. You see here IGV setting goes from 15 degrees to 82 degrees. That is the full range of IGV angle. So if you have a unique relationship which is independent of IGVs, then it is reasonable to make the conclusion that IGVs had no value -- or provide no benefit in the control system to -- IGV control in the surge control mechanism for the APU. So based on Turbomeca's data, it was clear we did not need to use

IGVs.
Q The ultimate conclusion was made by Turbomeca or Sundstrand?
A A combination. Turbomeca's data -- we were the control systems developer within the partnership. So when we developed our control system, we showed it having no IGV feed input to the P/P setpoint. We devised the control system. We made it work. We proved that it was, in fact, functional and did not need IGVs in that. So perhaps a better answer would be we, Sundstrand, made the determination that IGVs were not necessary in the surge control system.
Q Who at Sundstrand made that determination?
A A combination of the lead systems engineers, Kourosh Mehr-Ayin and myself.
Q Were those the only two people involved in making that decision?
A That was all that was necessary, yes.
Q So both you and Mr. Mehr-Ayin --
A Yes.
Q -- determined that the delta P/P setpoint didn't need to adjust in relation to IGV angle; is that correct?
A Correct.
Q And both of you made that determination based

that you are asking me to agree or disagree to.
BY MS. REZNIK:
Q Mr. Suttie, I'm just repeating your statement. I'm using your language. You said we, Sundstrand -- we are not familiar with which pieces of hardware Turbomeca used to collect the data in October of 1991.
A The actual pieces of hardware, that's true. We are not familiar.
Q You also stated that after 1991, you no longer contemplated using the surge control system depicted in Exhibit 22; correct?
A Correct.
Q How did the surge control system change after October 1991? Let me restate it. How did the surge control system for the APS 3200 change as a result of Turbomeca's coordination memo of 1991?
A The system specification was -- was written in a way which -- the system specification is a starting point for how the control system is to behave, and the system definition document did not show the delta P on P setpoint as a function of IGVs. So the people who then take the system requirements and write the software program -- software code met their requirements of the system specification, and the system specification did not call for IGVs being input into the P and P delta

on data supplied by Turbomeca?
A Correct.
Q But Turbomeca didn't advise you either way as to whether or not you should continue to use IGV angles in the setpoint. Is that a fair statement?
A Yes.
Q And is it also fair to say they were not familiar with the load compressors tested by Turbomeca in order to make that evaluation in that October 1991 coordination memo?
A We, Sundstrand, were not familiar with which pieces of hardware Turbomeca used to collect this data.
Q Okay. Let me state it again. So it's fair to say that Sundstrand was not familiar with the pieces of hardware Turbomeca used to collect the data relating to IGV angle and delta P/P setpoint in the October 1991 coordination memo?
MR. MCCRACKEN: Objection; asked and answered.
THE WITNESS: The data was collected in France with whatever Turbomeca test equipment they had there. When you say "familiar," I can't determine what -- "familiar" could mean I knew exactly what it was, or "familiar" could mean I didn't know it at all. And I had some vague idea of what it was, but I didn't know exactly. So it's hard to make the definitive statement

setpoint calculation. We changed to make delta P and P set value -- at that time, it wasn't a variable of anything. It was a hard, fixed value.
Q And that -- the fixed value that you then used was developed by Sundstrand, or was it based on data provided by Turbomeca?
A It was developed over a period by a series of coordination which went backward and forward between the two groups: Proposal, counterproposal. Much the way we discussed this morning. So it was a combination, and, in fact, that's one of the numbers which we ended up putting into the ICD, the interface control document, which was our stated way of agreeing when we had an interface between the two companies all through the engine. It was multiple interface control documents. We had an interface control document from the control system, and this was one of the parameters which was put into it. So it was a combination. It was a mutually agreed number.
Q You've testified previously that the use of a fixed value for the setpoint subsequently changed; is that correct?
A Correct.
Q What did it subsequently change to?
A It changed to be a function of the inlet

temperature, sometimes called T2. Essentially the temperature of air coming into the APU.
Q Who determined that the setpoint should be a function of the inlet temperature?
A In the research I did for this deposition, I found some coord memos from Turbomeca early, by Pierre Biscay, on February the 12th of 1992, proposing that -- February 21st. Sorry. I transposed those numbers. But we did not, in fact, implement that until 1994 or 1995 time frame. In fact, that was one of the features which came along with versions 3.2 and 4.1. So, as many things in the development of parts such as this, somebody might make a proposal, and others don't necessarily agree with it. Initially it gets discussed many times before it gets incorporated.
Q Do you know why Mr. Biscay at Turbomeca determined that the setpoint should be a function of the inlet temperature on the APS 3200?
A It would be analysis of test data -- flight test data that was obtained. He also got a copy of -- that memo was before flight test. Turbomeca supplied that in coordination with the actual process that they underwent to make that deduction. I'm not familiar with it. I never was. That's a question better asked of Turbomeca.

Q Do you know if anyone other than Mr. Biscay determined that the setpoint should be a function of inlet temperature?
A I don't know of anyone, no.
Q Do you know what Mr. Biscay's position was with Turbomeca at the time?
A He was an aerodynamics engineer.
Q Did Turbomeca directly advise Sundstrand that the setpoint should be a function of inlet temperature?
A They provided a coord memo with what is their recommendation, yes.
Q And Sundstrand then decided to follow Turbomeca's recommendation; correct?
MR. MCCRACKEN: Objection; asked and answered.
THE WITNESS: Two years later. We -- basically we elected not to follow it. There was some instance of flight test which prompted further discussion, and we, at that point, incorporated Turbomeca's idea of two years previous.
BY MS. REZNIK:
Q Mr. Suttie, I'm handing you what's previously been marked Exhibit 47. It's a coordination memo, Bates number HSB 2135483.
A 2135483, yes.
Q This is a coordination memo from Mr. Hardy at

Turbomeca; is that correct?
A Yes. It states from Gerard Hardy at the top.
Q And the subject is load compressor delta P/P setpoint; correct?
A Yes. I think it's used to -- I note it's approved by Herbert Vignau and Pierre Biscay's signatures.
Q Look at the first sentence. Towards the end of that first sentence it says, "It appears necessary." Can you read that for me?
A "It appears necessary to use a delta P/P setpoint function of IGV setting angle."
Q So at this point, Turbomeca is advising Sundstrand that the delta on P -- delta P/P setpoint should be a function of IGV setting angles; is that correct?
A "Advising" wouldn't be the word I would use. This was a technical discussion, and the "appears necessary" is a very mild conclusion statement. So it appears what they were saying to us was maybe we should be considering this.
Q But it's your earlier testimony that as of October 1991, it was determined by Turbomeca that delta P/P setpoint should not be a function of IGV setting angle; is that correct?

A I said as of 1991, we concluded, based on this data, that delta P on P setpoint should not be a function of IGVs.
Q "We" meaning Sundstrand?
A "We" meaning Sundstrand.
Q Do you know how Turbomeca came up with this determination in this Exhibit 47?
A No, I don't.
Q Did Sundstrand take that into consideration after this coordination memo was issued in December 1992?
A We considered it, yes. We -- for the next two years, as I mentioned previously, the delta P on P setpoint remained on value, and then we believed it adequate to make the delta P on P setpoint a function of temperature. And so we never incorporated Turbomeca's comment here.
Q Did Sundstrand ever test Turbomeca's comment regarding the delta P/P setpoint of IGV setting angle?
A No.
Q Did Sundstrand ever conduct an analysis of the delta P/P setpoint function of IGV setting angle based on the Turbomeca coordination memo depicted on Exhibit 47?
A No.

Q So this was just an idea tossed out by Turbomeca to Sundstrand at some point?
A Yes.
Q And you are not familiar with how Turbomeca came up with this determination in Exhibit 47; correct?
A Correct.
Q I'm handing you what's been previously marked Exhibit 75. And Exhibit 75 has Bates range numbers HSA 196543 through 196680. Do you have that document in front of you?
A Through 196680, yes.
Q Can you tell me what this document is?
A It appears to be a presentation which APIC made to the Boeing company for an airplane then known as the Boeing B737-X.
Q Can you tell me what APIC stands for?
A Auxiliary Power International Corporation.
Q Am I correct that APIC is a joint company of Labinal and Sundstrand Corporation?
A It was at the time. The date November 15, 1983 -- it was erroneous. It was, in fact, 1993.
Q Can you look at 196553 for me?
A 196553.
MR. MCCRACKEN: I'm having trouble seeing how this is encompassed by the 30(b)(6) notice.

MS. REZNIK: I'm getting there.
MR. MCCRACKEN: Okay. I'll take your word on that for now.
BY MS. REZNIK:
Q Are you at 196553?
A 196553.
Q Okay. Do you see in this diagram it lists the APS 3000 alongside with the APS 3200?
A Yes.
Q Do you know why they would be listed together like that?
A Yes.
Q Why?
A Because, I think I mentioned in my previous deposition, the second digit determines who the OEM customer was going to be. So the APS 3000 was a size of engine. The second digit indicated who the customer was. The 2 is the second digit and indicated Airbus was the customer. 0 in the second digit indicated that OEM was the customer. This is not to be confused with the initial offer of the APS 3000. We developed this second digit numbering system after we already mentioned to everybody the APS 3000. If you want the history, I can --
Q Yeah. Actually that would be great.

A APS 2000 was the previous -- a different kind of machine altogether. APS 2000 was like the Boeing. Then we came out with the APS 3000. Then -- only then did we start to think of coding the second digit to indicate who the customer was.
Q When you say "we came out with the APS 3000," that means you proposed the APS?
A The machine. Think of it as the APS 3000 series.
Q So as depicted in this diagram in Exhibit 75 at page 196553, is it fair to say that the APS 3000 and APS 3200 were essentially the same APU, but were just provided for different customers?
A The same core machine, but because different customers have different installation requirements, different ways to hold the engine, different connectors, different mechanical features, it has a different model number, the APS 3000, as opposed to 3200. But the core machinery was identical -- was intended to be identical. Again, this is a proposal phase for APS 3000 to Boeing. This is a presentation as a proposal.
Q As of November 1993, Sundstrand had done some testing on an APS 3200; correct?
A Yes.
Q And APS 3200 was already in development; is

that correct?
A Yes.
Q And it's your testimony that the APS 3200 that was already in development and testing as of the date of this document, November 1993, was essentially the same core machine as what is known as the APS 3000?
MR. MCCRACKEN: Objection; asked and answered.
THE WITNESS: With the statement APS 3000 was, at this point, being proposed to Boeing. No engine called APS 3000 existed.
BY MS. REZNIK:
Q But the proposed APS 3000 to Boeing was essentially the same core machine as the APS 3200; is that correct?
A Correct.
Q Turn to HSA 196555. There's a chart that reads, "APS 3000 Reaches Maturity Before 737X Service Introduction"; correct?
A Correct.
Q At the bottom there's a note. Can you read the second line of that note?
A "Data for APS 3000 represents actual A320/321 orders, firm and options."
MR. MCCRACKEN: I object to this line of questioning. It's not encompassed by the 30(b)(6)

notice.
BY MS. REZNIK:
Q Does this chart indicate that the data for evaluating accumulative APU operating hours on this chart was derived from data for the APS 3200? Correct?
A Yes.
Q So again this seems to indicate that there was an interchangeability between the analysis and testing of the APS 3200 and APS 3000?
MR. MCCRACKEN: This is clearly outside of the scope of the 30(b)(6) notice. I am objecting strenuously to the use of your time that is obviously limited. You should stick to the topics that are clearly inside the scope of the 30(b)(6) notice. Otherwise, to have us come back on a second day is adding expense for no reason, in my opinion. So I object to this line of questioning. I ask that you please stick to the 30(b)(6) topics.
BY MS. REZNIK:
Q Mr. Suttie, are you prepared to answer that question?
THE WITNESS: Could you repeat the question, please?
(Record read.)
MR. MCCRACKEN: I object to the question.

existence at the time of this proposal, was in existence by this proposal. By "this," it was the original APS 3200 proposal to Airbus in 1989. The naming convention became -- was developed after that Airbus proposal, and, therefore, the 3000 here is not the same as the APS 3000 as mentioned in the Airbus proposal.
Q So, then, it's still fair to say that the APS 3000 is just an earlier version of the APS 3200?
A No.
Q What's wrong with that statement?
A The APS 3000 is what we originally called -- what we proposed to Airbus. Then our naming convention for engines became more mature. In so doing, we identified the second digit on the four-digit number to identify who the OEM customer was. We already had an APU in service at Boeing on the 737 called the APS 2000, a different machine, a different technology.
But because we had an APU Boeing, the second digit was a zero. We were already locked in to calling the second digit an identifier for Boeing. Therefore, when we came along -- we had to leave. So, therefore, when we came along with the proposal for the APS 3000, we had not identified this naming convention.
We then found ourselves in a situation where we needed a naming convention, and we incorporated one,

THE WITNESS: As it indicates, there is interchangeability for the analysis and test data for the 3200 and 3000.
BY MS. REZNIK:
Q Turn to HSA 196570, please. Can you read for me the line that begins "August 1989"?
A August 1989, colon, single shaft load compressor design is selected for APS 3200.
Q Can you describe for me the relationship between the control logic of the 3200 and the 3000 as depicted in this proposal in 1993?
A Control logic for the APS 3000 for Boeing was never developed. It was a proposal. We were not selected for the airplane. We never did any development of the control system.
Q I'm just trying to understand the relationship between the two machines because, as I understood it earlier, the APU that included the surge control system logic depicted in Exhibit 22, this one, was described as the APS 3000; correct?
A It was called the APS 3000 originally, but, as I mentioned earlier, that's not to be confused with the APS 3000 as mentioned in 1993. The reason being is our naming convention started as an infant and started to grow, and so our naming convention, which wasn't in

albeit finding confusion because the 3000 previously described never existed, and now going forward; and by 1993 our naming convention was clear. Second digit equals zero was Boeing. Second digit equals 1 was McDonnell Douglas. Second digit equals 2 was Airbus.
So the APS 3000 described in this exhibit that we've been discussing in November of 1993 was with our new naming convention. Previous references in the '89 time frame to an APS 3000 should all automatically link to an APS 3200. There was never an APS 3000 developed. Think of all of the Airbus presentations and proposals and paperwork and coord memos. Even though it says 3000, it is 3200.
Q So after October 1991 references, if there are references to an APS 3000, that APS 3000 is not necessarily referring to an APS 3000 with the surge control system depicted in this Exhibit 22?
A You mentioned a cutoff of October. I do not know what the cutoff was. I think it was prior to October. I did not prepare to cover that today.
Q So just to be clear, the APS 3000 referenced in this Boeing proposal in 1993, which is Exhibit 75, did not include a surge control system such as the one depicted in Exhibit 22 which had the IGVs angle affect the delta P/P setpoint; is that correct?

MR. MCCRACKEN: Objection; asked and answered.
THE WITNESS: Correct. Did not include Exhibit 22-style control logic.
BY MS. REZNIK:
Q Got it. Because it had already been determined by that point that that logic was not going to be used in the APS 3000 series?
A Correct.
Q So we won't get confused by the reference to APS 3000 in later proposals -- we shouldn't be confused, and I believe that that APS 3000 is the same one being described in Exhibit 22; correct?
A Correct.
Q Can you describe for me the role of Turbomeca with regard to the design and development of the APS 3200?
A We had a 50/50 joint venture. Sundstrand had a joint venture with Turbomeca. Turbomeca was responsible for designing the second-stage turbine disk and nozzle, first-stage disk and nozzle. Turbomeca was responsible for the power section compressor and was responsible for the shaft that connected those three parts and also the load compressor. They were responsible for the plenum, and they were responsible for the load compressor control and the bearings on

control laws. We wrote the system specifications. We wrote the software. We did the testing, but Turbomeca had a role in defining how their product -- their part of the APU should be controlled.
Q You began to list many of the required parameters that were defined by Turbomeca. Would you be able to list for me all of the required parameters that were defined by Turbomeca for the APS 3200 control system?
A A lot of them. I couldn't guarantee to cover them all.
Q Could you just start to do a list, if you remember?
A Exhaust gas temperature, exhaust gas temperature limit, exhaust gas temperature setpoint during start, exhaust gas limit, exhaust gas temperature limit -- that's EGT -- separating speed, number of teeth on the phonic that gave the speed, sensor signal, IGV angle, a function of the aircraft demand signal for performance information. That's a significant subset of the ICD.
Q I will provide you with the most current version of the APIC ECB requirements specifications. Could you point out for me which aspects Turbomeca played a role in developing?

which that rotor ran.
Q In dividing the responsibility between the companies in the joint venture, is it fair to say that Sundstrand had the responsibility for designing and developing the control logic for the APS 3200?
A Yes.
Q Did Turbomeca have any role in the design and development of the control logic of the APS 3200?
MR. MCCRACKEN: Objection; asked and answered.
THE WITNESS: Yes. They had a role.
BY MS. REZNIK:
Q What was Turbomeca's role?
A To define, where appropriate, how they wanted the control system to control the APU. They had input on EGT setpoints. They told us what the speed of the machine would be. The control system has interaction with many parts of the APU. We wrote an ICD, as I mentioned, to ensure that -- ICD stands for interface control document -- to ensure that we have clear delineation and definition of the requirements for the control system. So many of the required parameters or controls were defined by Turbomeca, the exhaust temperature, the limits duration cooldown period.
Control system is, by definition, a joint venture. We implemented the control. We wrote the

A If it will prompt me, yes.
Q I'm handing you what's been previously marked as Exhibit 9. You can put that one away.
Counsel, you should already have this.
MR. MCCRACKEN: We do. If I may look at it.
MS. REZNIK: If you don't want to take it back, that's fine.
Q So for the record, Exhibit 9 is the most current APS 3200 ECB requirements specifications; correct?
A Yes. 0677, revision N.
Q If you turn to HSA 96920 --
A 96920.
Q -- you'll see a diagram -- or a figure of the closed-loop PI surge control.
A 969 --
Q -- 20. Yeah.
A Okay. I'm there.
Q Okay. Looking at this figure, can you indicate for me which aspects of this surge control Turbomeca played some role in developing or designing?
A As we mentioned before, the input of inlet temperature to the surge setpoint was a joint agreement between -- proposed by Turbomeca, reviewed by us. We proposed back and forth to finally agree on this table

here showing T2 versus surge setpoint, and the rest of this diagram was not defined by Turbomeca. It was defined by Sundstrand.

Q If you were to browse quickly through this document, would you be able to indicate any other input Turbomeca had in the design and development of the APS 3200 control logic?

MR. MCCRACKEN: Take the time you need to look at that document carefully.

THE WITNESS: Figure 5, HSA 6907, the determination for a need of a cooldown state and the duration of implementation of a cooldown state. When a machine is running very hot and you cool it -- and you've got to stop, it cools down from a very hot temperature. This can cause thermal stress to the engine. If you run it in a very hot temperature, if you come down to an intermediate temperature and then you come down and you allow it to cool down, you can reduce the amount of thermal damage -- thermal stress to the machine.

Turbomeca, being the designer of the hot section of the APU -- it was very important for them that they had a control system feature to cool the machine down. They defined that. They told us how long it would -- we discussed it backward and forward, how it

THE WITNESS: All information regarding EGT, and while it was Sundstrand's responsibility to design and procure the thermocouples, they were located in the part of the engine which was Turbomeca's responsibility. Therefore, their relative location to the areas of the engine which they were trying to make sure did not get too hot, was up to Turbomeca to help to specify. So EGT setpoints, EGT limits were Turbomeca-defined.

BY MS. REZNIK:

Q Perhaps I can help us along if you look at page 62 of Exhibit 9. It may not be a Bates number HSA. It will be document numbers.

A Exhibit 9?

Q The same exhibit, page 62 of this document.

A Okay.

Q On this page it lists various sections relating to closed loop speed control, closed loop load compressor BCV control, and closed loop load compressor IGV control; correct?

A Yes.

Q Looking at this page, can you identify for me what role Turbomeca had in any of these elements of the APS 3200 control?

MR. MCCRACKEN: I object to the extent that the question asks for a detail not at issue in this lawsuit.

would be implemented. They are the requester for the control system.

BY MS. REZNIK:

Q Do you know who at Turbomeca would have been responsible for that?

A Gerard Hardy was the individual who was the coordinator of Turbomeca. We always saw memos from Gerard, what support he got. On page HSA 96905, the fifth block -- the block that starts -- if you look at the third diamond down, that block gives the temperature less 23 degrees Fahrenheit, which is P2 less 10.1 psia. That block determines whether we energize the fuel valve. That was Turbomeca's request.

Q Is that also Mr. Hardy's area?

A We received information from Gerard Hardy. They had a very centralized office that we received raw data from.

MR. MCCRACKEN: I'll interpose an objection here. I realize it comes later in the question, but these details aren't relevant to the issue of the lawsuit. To have the witness go through and identify portions that have nothing to do with the surge control system or the fuel control system is not likely to lead to the discovery of admissible evidence. So I object on the relevancy basis.

THE WITNESS: Of those three sections you mentioned, Turbomeca did not define any of those requirements.

BY MS. REZNIK:

Q Did they make any contributions to the requirements for the surge control system on the APS 3200?

A As we previously mentioned, they were -- they had input to making the setpoint function of inlet temperature.

Q Other than making the setpoint function of inlet temperature, did they have any contribution to the design and development of the APS 3200?

A They had a general requirement that the control system should function as efficiently as possible so that no perform -- so that the performance of the APU would be maximized, but they did not define details as to how to do that. It's an obvious statement. We were trying to make it as efficient as possible.

Q So in terms of a direct, specific contribution that Turbomeca made in the design and development of the surge control system of the APS 3200, the determination that the delta P/P setpoint should be a function of inlet temperature was a contribution made by Turbomeca?

MR. MCCRACKEN: Objection; asked and answered.

THE WITNESS: Yes.
BY MS. REZNIK:
Q And that's the only specific contribution to the APS 3200 surge control system by Turbomeca that you know of; is that correct?
MR. MCCRACKEN: Objection; asked and answered multiple times.
THE WITNESS: You ask the question again, please.
(Record read.)
THE WITNESS: Coupled with the figure that we discussed which showed delta P on P as a function of air flow, which was a very important input to the control system, which we had received from Turbomeca.
BY MS. REZNIK:
Q So to be clear, the specific contributions that Turbomeca made with respect to the surge control system of the APS 3200 are the determination that the setpoint is a function of inlet temperature and the fact that delta P/P is a function of air flow; is that correct?
A A function of air flow which was independent of IGVs. That's correct.
Q Throughout Turbomeca's involvement with the APS 3200 program, were they always involved in determining the air flow parameter and setpoint to be used in the

A Yes.
Q So it's fair to say that one role Turbomeca played in the development of the APS 3200 was helping to solve this delta P/P noise issue; is that correct?
A Yes.
Q And this delta P/P noise issue is relating to the measurement of the air flow through the load compressor on the APS 3200; is that correct?
MR. MCCRACKEN: Objection. That's been asked and answered many times, not only today, but in his previous deposition.
THE WITNESS: Can you repeat the question, again?
(Record read.)
BY MS. REZNIK:
Q Is it fair to say that the delta P/P noise issue is relating to the design and development of the surge control system on the APS 3200?
A Delta P on P, as we discussed, is an input parameter to the surge control system.
Q So, yes, the delta P/P noise issue would have had a relation to the surge control system of the APS 3200?
A Yes.
Q If you turn to the next page, HSB 215490, it

APS 3200?
A Yes.
Q And I think, as we discussed before, the extent of Turbomeca's involvement in determining the air flow parameter and setpoint to be used in the APS 3200 was load compressor testing and other analysis; correct?
A Load compressor testing, yes.
MS. REZNIK: Let me just take a minute to gather -- to see how much is left and see if we can wrap it up.
MR. MCCRACKEN: Sure.
(Recess.)
BY MS. REZNIK:
Q I'm handing you what's been previously marked as Exhibit 7, which is a coordination memo from Mr. Hardy at Turbomeca dated October 22nd, 1992; correct?
A Yes.
Q You have this in front of you; right?
A Yes.
Q What's the subject of this coordination memo?
A Delta P/P noise.
Q And it indicates that Turbomeca was providing information to Sundstrand regarding a current plan for solving the delta P/P noise issue; is that correct?

describes a delta P/P noise-solving plan developed by Turbomeca; correct?
A Yes.
Q To the left of that it says "GTCP 331-350 L/C module"; correct?
A Yes.
Q And you understand that GTCP 331-350 is an APU developed by Garrett, now Honeywell; is that correct? Actually, let me rephrase the question. You understand that GTCP 331-350 L/C is an APU developed by Garrett, now Honeywell; is that correct?
MR. MCCRACKEN: These issues -- I object. These issues were raised at length in his prior deposition. This question has been asked and answered.
THE WITNESS: Yes.
BY MS. REZNIK:
Q So as part of Turbomeca delta P/P noise-solving plan, they were conducting tests on this Honeywell APU; is that correct?
A No.
Q Why is that not a correct statement?
A Turbomeca designed and developed the load compressor for that APU. It was Turbomeca's engineering, Turbomeca's expertise, Turbomeca's development cost. They used the GTCP 331-350 as a

scriptor for the piece of equipment that they had designed and supplied to AlliedSignal. So when they are testing something, they are testing their own design, their own technology. They happen to supply that to Honeywell, then AlliedSignal. And so this is just a name -- a scriptor.

Q So it's your understanding that the reference to GTCP 331-350 load compressor module has nothing to do with Honeywell's APU?

A No. That's not what I said. This is testing Turbomeca's load compressor module, which they designed and developed at their own expense and sold to AlliedSignal. But it says load compressor module. That, in definition, says that it was not an APU, that it was running because it was just the load compressor module which they sold to AlliedSignal. So it was their own equipment, their design, their technology.

Q Is it fair to say that the load compressor module testing played a role in the delta P/P noise-solving plan --

MR. MCCRACKEN: Objection; vague.

MS. REZNIK: I didn't finish the question.

MR. MCCRACKEN: I apologize for interrupting.

MS. REZNIK: Let me repeat it.

Q Is it fair to say that the load compressor

module testing played a role in the delta P/P noise-solving plan developed by Turbomeca for the APS 3200?

MR. MCCRACKEN: Objection.

THE WITNESS: Turbomeca collected data from these load compressor modules with a view to seeing if the noise was present on their other design. So when I say they played a role, we collected data.

BY MS. REZNIK:

Q But it's listed here among their noise-solving plan, correct, listed among Turbomeca's noise-solving plan; correct?

A Well, this was a joint noise-solving plan. This was Turbomeca's portion of it. The issue was, in fact, solved by Sundstrand.

Q And where it says detailed analysis of APS 3000, you understand that to be the same as the 3200; correct?

A Yes.

Q So is it Sundstrand's belief that the testing referenced here for the 331-350 load compressor module was information Turbomeca had the right to share with Sundstrand?

A Yes.

Q I'm handing you what's been marked as Exhibit 8

in a previous deposition. It's a coordination memo, Bates numbers HSA 190251 to 252. Do you have that in front of you, Mr. Suttie?

A 190251 to 190252, yes, I do.

Q This coordination memo is from you to Mr. Hardy; is that correct?

A Yes.

Q And the subject is load compressor air flow measurement; correct?

A Yes.

Q In number 2 it references again the GTCP-350 load compressor. Do you see that?

A Yes.

Q And the rest of this coordination memo describes the delta P sensor and the air flow measurement of the load compressor; is that correct?

A Those two terms are used synonymously. We call it the delta P sensor. Sometimes it's called the air flow sensor.

Q So is that a yes?

MR. MCCRACKEN: Do you need the question read back?

THE WITNESS: Yes, please.

(Record read.)

THE WITNESS: Yes.

BY MS. REZNIK:

Q It's Turbomeca who had the responsibility, as defined before, for evaluating load compressor air flow measurement; is that correct?

A Yes.

Q It starts here in the beginning with, "Data from B. Macarez."

A Yes.

Q Can you just quickly read that sentence for me?

A "Data from B. Macarez indicates that the GAPD sensor used to be 0-20 Psid. However, he stated that this data may be out of date."

Q Do you know who B. Macarez is?

MR. MCCRACKEN: Objection. This is ground that has been covered extensively in his prior deposition.

THE WITNESS: Bernie Macarez. Yes, I know who he is.

BY MS. REZNIK:

Q Was he employed by Turbomeca?

A Yes.

Q And he was involved in the APS 3200 control system; is that correct?

A No. He was Turbomeca's liaison engineer for the whole program, and he resided in San Diego.

Q So Mr. Macarez was involved with the APS 3200

program from Turbomeca's side?
A Yes.
Q And it indicates here that Mr. Macarez provided information regarding the GAPD sensor; is that correct?
A Yes.
Q And the GAPD sensor, as we've described before, relates to Garrett -- now Honeywell's -- sensor; is that correct?
A Yes.
Q Is this data provided by Mr. Macarez an example of the type of data that was often provided to Sundstrand by Turbomeca?
A No.
Q Why is that not a fair statement?
A You said typically. I can't think of any other instance with data of this nature. So this is an isolated case.
Q Earlier we looked at Exhibit 7, an example of references by Turbomeca to the GTCP 350 load compressor module; correct?
A That's just a name that Turbomeca gave a piece of equipment which they had designed, yes. It's just a name.
Q So information Turbomeca had acquired in their development of that 350 load compressor module was often

Turbomeca of sensors; correct?
MR. MCCRACKEN: I object to this line of questioning as being repetitive of earlier questioning in his individual deposition.
THE WITNESS: Can you repeat the question, please?
(Record read.)
THE WITNESS: No.
BY MS. REZNIK:
Q What does it describe?
A It's exactly the same information we just described. The date -- this is one day off from when the coord memo was sent, and this is testing of the Turbomeca's designed load compressors which would be named GTCP 330 through 350.
Q So the first sentence reads, in this coordination memo, the unstationary sensors which are going to be used on the Garrett modules and Q23 have a transient frequency response of 3000 Hz, period; is that correct?
A Hz. Yeah.
Q Then later references three Garrett modules that are in the course of testing; correct?
A Three modules Turbomeca designed for -- for and sold.

supplied to Sundstrand; correct?
MR. MCCRACKEN: Objection; vague, ambiguous.
THE WITNESS: No.
BY MS. REZNIK:
Q Was such information ever supplied to Sundstrand by Turbomeca?
A What do you mean by "such information"?
Q Information relating to Turbomeca's development of that 350 load compressor.
A On this one occasion -- one instance Turbomeca supplied data concerning the load compressor which they had designed. They were the design authority for. They chose to call it the information. They gave it a reference for any APU that it would be designed for.
Q I'll hand you what's been previously marked Exhibit 10, a coordination memo with Bates number HSB 215448. Do you have that in front of you, Mr. Suttie?
A 215448, yes.
Q This is a coordination memo from a Mr. Tuquoi at Turbomeca; is that correct?
A Yes.
Q And this coordination memo relates to the delta P/P measurement; is that correct?
A Yes.
Q This memo goes on to describe testing by

Q Which is now known as Honeywell; correct?
A Yes.
Q It indicates at the bottom of this coordination memo that Turbomeca intends to keep Sundstrand informed of the status of all these tests of these Garrett modules; is that correct?
A Of the modules Turbomeca designed, yes.
Q So it's fair to say, then, that in the process of providing information regarding the delta P/P measurements to Sundstrand, Turbomeca often refers to the Honeywell modules that it was, at that time, developing for Honeywell -- or in combination with Honeywell; is that correct?
MR. MCCRACKEN: Objection.
THE WITNESS: I don't agree with the word "often." It's an isolated case. We are all referring to the same series of tests, the same test plan, and it was testing of modules which Turbomeca had designed and developed themselves.
BY MS. REZNIK:
Q So if I show you a handful of these same types of coordination memos on different dates, would you, then, be able to say that Turbomeca, in the process of providing information to Sundstrand, often referred to these Honeywell's APUs that it was at that point

designing?
A Turbomeca wasn't designing Honeywell's APUs.
Q Let me restate it. If I were to show you coordination memos on different dates describing Turbomeca's analysis and testing of the load compressor modules that it was developing for Honeywell's APUs at that time, would it, then, be fair to say that Turbomeca often referred to that information in coordination memos with Sundstrand?
MR. McCRACKEN: Objection.
THE WITNESS: I would not use the word "often." This was a development lasting four years. "Often," to me, it would be much greater frequency.
BY MS. REZNIK:
Q Okay. Would it be fair to say that Turbomeca, in the process of providing information regarding delta P/P measurements to Sundstrand, would refer to its development and testing of load compressor modules that it intended to use in its contract with Honeywell?
A Yes.
MR. McCRACKEN: Counsel, we are at 5 o'clock, I believe.
MS. REZNIK: Okay. Are you prepared to go any further, or is this the time you need to leave?
MR. McCRACKEN: How much time do you need? I

mean, if you are talking five minutes, he's got five minutes. Right?
THE WITNESS: Right.
MR. McCRACKEN: But five or ten minutes at the most. Beyond that, you are going to be late.
THE WITNESS: Yes.
MR. McCRACKEN: I'm sorry. I don't mean to be inquisitive.
THE WITNESS: Yes, I am. It's this individual. He's from out of town, and he doesn't know his way around.
MS. REZNIK: Would 15 minutes be okay? Can you go for 10 minutes? You said -- would that be -- I'm not sure if I'd end up finishing, but I just want to get in this line. We should go off the record.
(Recess.)
BY MS. REZNIK:
Q So, again, looking back at Turbomeca's contribution to the design and development of the APS 3200, it would be fair to say that Turbomeca had a significant role in the development of the load compressor air flow measurements; correct?
A Yes.
Q Would it also be fair to say that Turbomeca played a significant role in helping to solve the delta

P/P noise issue?
MR. McCRACKEN: Objection; vague and ambiguous.
THE WITNESS: No. They collected some data, but we solved that issue ourselves.
BY MS. REZNIK:
Q Would it be fair to say that they played a role in helping you to identify how to -- let me restate it. Would it be fair to say that Turbomeca played a role in helping Sundstrand to identify a solution to the delta P/P noise issue for the APS 3200?
MR. McCRACKEN: Objection.
THE WITNESS: No. They collected some data and passed it to us. We had to analyze it and pick out the method of solving the problem.
BY MS. REZNIK:
Q The data provided to you by Turbomeca wasn't helpful. Is that what you are saying?
A It was helpful, but it's a small first step in the problem solving. You have to collect some good data, but then comes the hard part -- business devising, thinking of some way to solve the problem -- and we determined that.
Q I understand. So, then, it would be fair to say that Turbomeca played a role in helping you to identify how to solve the delta P/P noise issue based on

the data they provided to you?
MR. McCRACKEN: Objection; asked and answered.
THE WITNESS: Based on the data they provided, yes.
BY MS. REZNIK:
Q Would it be fair to say also that Turbomeca had a significant role in the development of the load compressor delta P/P setpoint for the APS 3200?
MR. McCRACKEN: Objection, vague.
THE WITNESS: They played a role in assisting us to develop delta P on P setpoint, yes.
BY MS. REZNIK:
Q Would you say they played a significant role in the development of the delta P/P setpoint?
A They played a less significant role than Sundstrand. There are only two parties. One played more significant than the other, and I feel that Sundstrand played the primary role.
Q Is it also fair to say that Turbomeca played a significant role in the development of the delta P/P sensors and related measurements that they provided for the APS 3200?
A No. They didn't play a role in selecting or devising the sensor. They did provide what the absolute values -- the range of the parameters would be, which